

## Mirant

### Assessment of ESP to Bag House Conversion at Potomac River

Potomac River Units 1-5 consists of two 88 MW (1 & 2) and three 102 MW (3, 4, & 5) units. Each unit is equipped with a hot side electrostatic precipitator followed by a cold side precipitator. This document summarizes past findings investigating the performance improvements and costs associated with replacing the existing cold-side precipitators with bag houses. Although the electrical output of Units 1 and 2 is less than the output of Units 3 – 5, the amount of coal feed and flue gas generated is greater because these older units 1 and 2 are not as thermodynamically efficient as the newer units 3, 4 and 5.

#### Performance Issues

The existing combination of a hot-ESP and a cold-ESP on each unit provides excellent particulate matter removal. In December 2006, Mirant contracted with TRC to conduct particulate emissions testing on Units 2 and 3 (as representative of their sister units) to determine the impact of Trona injection on the ESP performance. Unit 2 had average particulate emission rate of 0.013 - 0.016 lb/mmBtu and Unit 3 had average particulate emission rate of 0.012 – 0.014 lb/mmBtu.

Bag houses typically are being permitted with limits of 0.015 lb/mmBtu. In some situations, companies are seeking guarantees that lower this value further and are at times offered guarantees of 0.012 to 0.013 lb/mmBtu for full-sized baghouses. The PM emission levels achieved for such new facilities do not apply to a complex retrofit such as the one that would be required at Potomac River.

The existing emission rates as measured at Potomac River are very close to the guarantee levels for bag houses, with very little improvement possible. The cost in dollars per ton of particulate removed indicates the project simply would not be economically feasible.

#### Costs

S&L examined the order of magnitude costs for installation of a bag house replacement in early 2006. The costs for each unit are based on a similar project. At that time the total cost to conduct the replacement was estimated at about 60 million dollars, see Table 1 below. This is based on the higher costs anticipated for installation of the equipment and is not based on quoted values.

Table 1

		<b>Unit 1 or 2</b>	<b>Unit 3, 4, or 5</b>
Gas Flow	acfm	468,000	384,000
A/C ratio		6	6
Baghouse Cost	\$	3,605,000	3,159,000
Construction	\$	5,353,000	4,691,000
Engineering, BOP, Etc.	\$	1,912,000	1,675,000
Total Typical Installed Cost for Each	\$	10,870,000	9,525,000
40% Additional Labor for Retrofit Difficulty	\$	2,140,000	1,880,000
<b>Total Cost Each</b>	<b>\$</b>	<b>13,010,000</b>	<b>11,405,000</b>
<b>Total for all 5 Units (2006 estimate)</b>	<b>\$</b>	<b>60,235,000</b>	

**Notes:**

1. Does not include costs for new ID fan providing additional pressure drop
2. Does not include costs to upgrade plant electrical infrastructure
3. Does not include additional costs for Station Ash Handling modifications

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On September 4, 2007, S&L attended a meeting with Mirant, Hamon (a leading supplier of bag house and ESP equipment to power generation facilities), and consultants to the City of Alexandria, Va. During this meeting 1) the physical arrangement of the existing ESPs were reviewed; 2) the attributes of bag houses and ESPs were reviewed; and 3) the relative degree of difficulty associated with such a retrofit was discussed. At this meeting Hamon indicated that the retrofit would be very difficult to perform in such a tight space as the current cold-ESP location.

After this meeting, Hamon provided a budgetary quote for the supply of bag house equipment (not including installation). They estimated that the equipment supply cost for each bag house would be approximately 3 million dollars, very close to S&L's estimate. Hamon indicated they would guarantee an outlet emission rate of 0.012 lb/mmBtu of particulate emissions. Hamon indicated at the September 4 meeting that this installation would be very difficult and that labor could exceed double a traditional bag house installation. In S&L's 2006 estimate (above) only 40% additional labor was added for a "difficult retrofit". Thus based on the meeting with Hamon, it is likely that the installed costs could exceed 75 million dollars based on budgetary quotations and Hamon's opinion on a very-difficult installation. Furthermore, Hamon suggested that unit outages of as much as 6 months for each unit would likely be required to demolish each ESP and to replace it with a new bag house. From the information provided by Hamon, it is very difficult to **firmly** identify the labor associated with a retrofit of this type for budgetary purposes. It would require a vendor/construction contractor to carefully assess the full requirements associated with the demolition of the ESP and the reconstruction of the bag house in the tight confines of Potomac River before they could provide a firm-price quotation for such a project.

The cost to replace the ID Fans and modify existing ductwork at Potomac River could add as much as 20 – 25 million dollars to the overall costs. Electrical upgrades and modifications for the ash system to accommodate this bag house have not been fully evaluated but could add \$15 - \$20 million to the project.

Table 2 reflects the new estimate reflecting the most current understanding of total costs

\$60M plus \$15 M for difficulty = \$75 M plus \$20M for fans and other plant modifications, but not including upgrades to the auxiliary power systems.

Table 2

		Unit 1 or 2	Unit 3, 4, or 5
Gas Flow	acfm	468,000	384,000
A/C ratio		6	6
Baghouse Cost	\$	3,605,000	3,159,000
Construction	\$	5,353,000	4,691,000
Engineering, BOP, Etc.	\$	1,912,000	1,675,000
Total Typical Installed Cost for Each	\$	10,870,000	9,525,000
Additional Labor for Retrofit Difficulty	\$	5,376,000	4,723,000
<b>Total Cost Each</b>	<b>\$</b>	<b>16,246,000</b>	<b>14,248,000</b>
<b>Total for all 5 Units (2006 estimate)</b>	<b>\$</b>	<b>75,236,000</b>	
<b>Notes:</b> 1. Does not include costs for new ID fan providing additional pressure drop 2. Does not include costs to upgrade plant electrical infrastructure 3. Does not include additional costs for Station Ash Handling modifications			